

### **REMARKS/ARGUMENTS**

Applicants have amended Claims 1 and 3 to clarify the invention; Applicants have also added new Claim 7. No new matter has been introduced as a result of these amendments. Reconsideration and allowance of the above identified application is respectfully requested in light of the above amendments and the following remarks.

#### **The Present Invention**

To briefly summarize, the claimed invention relates to a longwall support control for controlling the movements of longwall support units **1-18** in the longwall of a mine. In prior art longwall support control systems, a failure in a mining shield control device makes the entire system inoperative. However, the present invention advantageously permits operating the system despite such failure.

The invention as defined in the claims of the application comprises a plurality of longwall support units **1-18**, a central control system **50, 51**, and a plurality of mining shield control devices **34** connected to the support units and connected to the control system via at least one bus line **58**.

Each mining shield control device **34** stores a unique code word and is programmed to be activated to carry out the respective shield functions only when the stored code word is received from the bus line.

As important features of the present invention, each mining shield control device comprises a multichannel radio transceiver, which permits a permanent and simultaneous back and forth (transmit and receive) contact of the mining shield control devices with a decentralized, portable operating device for simultaneously receiving control signals, and transmitting data of measurement. In such a manner, and as recited in amended independent Claim 1, the mining shield control device closest to the operating device receives the strongest signal from the decentralized operating device. This mining shield control device then is able to retransmit the received signal via the at least one bus line to the other mining shield control devices so that the mining shield control device that has been addressed by the code word is able to respond. Since

the shortest possible radio link is used, there is no need of a high energy radio transceiver or a large antenna. Nonetheless, direct back and forth radio contact between the portable operating device and the selected shield control is possible.

The Claim Rejections Under §103(a)

In the Official Action, the Examiner rejected Claims 1, 3, 5, and 6 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 4,146,271 to Ward et al. (the Ward et al. reference) or U.S. Patent No. 5,029,943 to Merriman (the Merriman reference) in view of British document GB 2265652 (British document '652). The Official Action also rejected Claims 1, 3, 5, and 6 under 35 U.S.C. §103(a) as being unpatentable over British document GB 2167924 (British document '924) in view of British document '652.

The Ward reference shows a mine roof support system with a remote control **22** and a plurality of unit control means **20**, each associated to one of the roof support units. A multicore cable **23**, consisting of a plurality of individual cores **25** connects via cable sockets **26**, **27** on each unit the control means **20** of neighboring roof support units and with the remote control **22**.

The Ward reference furthermore indicates (see Claim 1), that the units at each of the supports have means for receiving function initiating signals as well as means for transmitting data. Ward shows external input modules **112** and internal input modules **113**, with the term internal inputs intended to mean lines feeding in presets at the central control console itself (col. 9, lines 26-30). Internal input module **113** is shown with input lines **130** from various control console input means such as push buttons, thumbwheels and switches (col. 10, lines 1-3).

Column 10 of the Ward reference refers to various inputs and the respective input lines **131**, **132**, **133**, **138**, **139**, **140**, **141**, **142**. However, these lines do not comprise a multichannel radio transceiver and a radio link to a portable control device as presently claimed. Nor is there any suggestion that control signals are only converted to functions of the long wall support, when the control signal is associated with a code word, which in turn is associated to the called up shield control device, as presently claimed.

The Merriman reference relates to a mining machine **11** traveling along a series of roof supports **16**. Information gathered on the mining machine is transmitted by a transmitter **30** of

the machine to a receiver **32** on each of the roof supports **16**, connected to the control box **27** on each roof support. The control boxes are electrically connected to each other so that events on one support can be used to control an adjacent support (col. 3, lines 65-68).

As shown in Fig. 3, the control boxes **27** are connected to each other by one cable. Data received by one control box **27** is then passed along existing links to the face end control unit **28** (col. 4, lines 21-22).

The Merriman reference is silent with respect to those links. What can be determined is, that those links are constituted by cables between two neighboring control boxes **27**. The cable stretches from the exit of one of the control boxes **27** to the entrance of the next one and then to the face end control unit **28**. Those cables are adapted to transfer measurement information collected on and by the mining machine from the mining machine via transmitter **30** and the nearest receiver **32** by infrared ray to one of the control boxes **27**. There is no radio transceiver on each of the control boxes for receiving control signals and simultaneously returning data of measurement and state, as recited in present Claim 1.

British document '924 discloses a powered support system that includes various support frame units **1**, which are controllable individually or in groups by a computer **6**. *See* Abstract. The support units **1** are numbered consecutively and are addressable by keying the support unit number into a transmitter **12**. *See* page 2, lines 100-105. The computer **6** is connected to the support units **1** via a common line **8**, which comprises a coaxial cable. *See* page 2, lines 45-54; Abstract. British document '924 does not disclose each mining shield control device having a multi-channel radio transceiver.

The Examiner cites British document '652 as teaching a multi-channel radio transceiver. British document '652 discloses a back and forth communication system between a portable data unit **12/32** to a central computer **13/30**, in Fig. 1 by radio, in Fig. 3 by infrared, and in Fig. 4 by both radio and infrared. In Fig 3, the signals are fed through the control units **31**, which are connected to the control computer **30** by wires (page 5, lines 17-20). In Fig. 4, data unit **42** includes an infrared transmitter for transmitting infrared signals to control units **41**, which include infrared receivers. Base radio **43** includes a radio transmitter for transmitting radio signals to the data unit **42**, which includes a radio receiver **44**. Applicants submit,

however, that British document '652 does not disclose each mining shield control device having a multi-channel radio transceiver and the mining shield control devices being interconnected by at least bus line such that a mining shield control device closest to the decentralized operating device receives the strongest signal from the decentralized operating device and retransmits the received signal via the at least one bus line to the other mining shield control devices, as recited by amended independent Claim 1. This is an important distinction because by communicating with the mining shield closest to the decentralized operating device and then retransmitting the received signal via the at least one bus line to the other mining shield control devices, the present invention avoids the need for a high energy radio transceiver or a large antenna as described by British document '652.

In view of the remarks presented above, it is respectfully submitted that the rejection under 35 U.S.C. § 103(a) of independent Claim 1 with respect to the combination of the Ward or Merriman references and British document '652, as well as the combination of British document '924 and British document '652, is overcome. Since Claims 3, 5, and 6 depend from independent Claim 1, these claims also avoid the rejection.

#### Summary

For the reasons set forth above, it is respectfully submitted that the rejection of independent Claim 1 under Section 103 of the Patent Statute has been overcome. Since Claims 3, 5, 6 and 7 depend from independent Claim 1, it is respectfully submitted that these claims are also in condition for allowance. Such action is solicited.

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